

Achromatic Metamaterial Polarization Modulator for Precision CMB Measurements

Completed Technology Project (2015 - 2018)



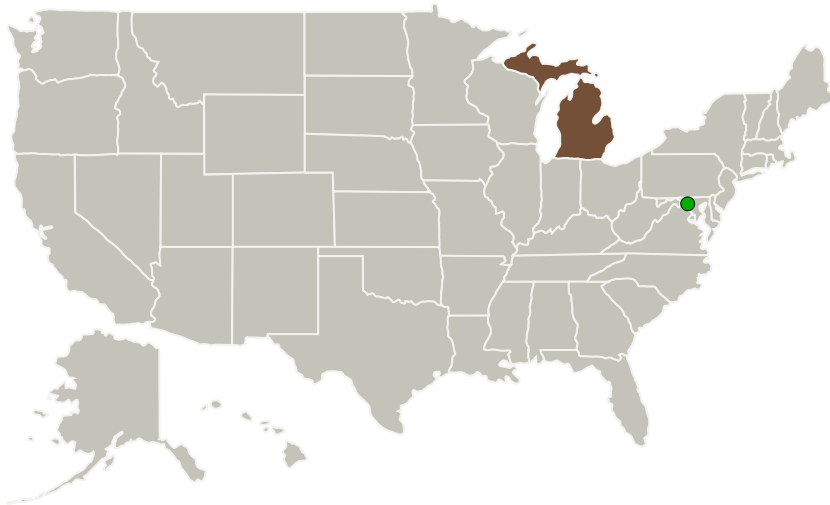
Project Introduction

I propose to develop novel metamaterial silicon half wave plates and antireflection coatings for use in cosmic microwave background observations. These new HWPs and AR coatings will have lower loss and broader bandwidth than conventional sapphire hwps or other AR coatings. These coatings will be designed using computer simulations including commercial high frequency finite element analysis software. They will be fabricated using our custom three axis dicing saw here at the University of Michigan, and they will be deployed in the field on ACTPol and the PIPER balloon. Together, these new technologies will allow for unambiguous detection of primordial gravitational waves.

Anticipated Benefits

These new technologies will allow for unambiguous detection of primordial gravitational waves.

Primary U.S. Work Locations and Key Partners



Achromatic Metamaterial
Polarization Modulator for
Precision CMB Measurements


Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Project Website:	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destination	3

Achromatic Metamaterial Polarization Modulator for Precision CMB Measurements

Completed Technology Project (2015 - 2018)



Organizations Performing Work	Role	Type	Location
University of Michigan-Ann Arbor	Lead Organization	Academia	Ann Arbor, Michigan
 Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Michigan

Project Website:

<https://www.nasa.gov/strg#.VQb6T0jJzyE>

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

University of Michigan-Ann Arbor

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Jeff McMahon

Co-Investigator:

Kevin P Coughlin

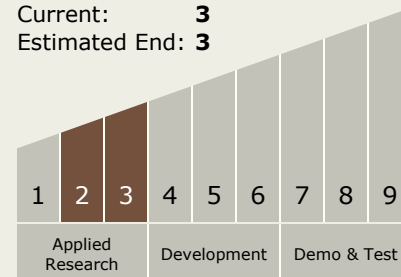
Achromatic Metamaterial Polarization Modulator for Precision CMB Measurements

Completed Technology Project (2015 - 2018)



Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.5 Coatings

Target Destination

Others Inside the Solar System